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Draft DOE-STD-1020-2011
NPH Analysis & Design Criteria for DOE Facilities
Briefing Nuclear Safety Workshop

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Bottom Line Up Front

- The new 1020 standard will incorporate current practices and maintain at least the same level of safety as the previous 1020 series of standards

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Overview of Today's Meeting

- Standard 1020-2011
  - Background and Evolution
  - Provisions on Modification and Evaluation of Existing Facilities
- Question and Answer

- Backup material (will not be briefed)
  - Seismic Hazards Provisions
  - Extreme Wind Hazards Provisions
  - Flood Hazards Provisions
  - Lightning Hazards Provisions
  - Snow Hazards Provisions
  - Volcanic Eruption Hazards Provisions

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Background & Evolution in DOE-STD-1020-2011 (cont'd)

Use of Voluntary Consensus Standards (VCS) encouraged by 1995 National Technology Transfer & Advancement Act

DOE actively participates in development of several national VCSs to limit preparation of its own standards

Active VCS seismic hazards in STD-1020-2011

- **ANSI/ANS 2.26-2010 (Seismic design categorization)**
- **ANSI/ANS 2.27-2008 (Seismic site characterization)**
- **ANSI/ANS 2.29-2008 (Probabilistic seismic hazard assessment)**
- **ASCE/SEI 43-05 (Seismic design)**

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Background & Evolution in DOE-STD-1020-2011 (cont'd)

For seismic hazards evaluation, DOE formally adopted these 4 VCSs in STD-1189-2008 Appendix A

Since VCSs for extreme wind and flood hazard evaluations were not yet available, continued use of STD-1020-2002 & DOE Guide 420.1-2 for those NPHs

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Background & Evolution in DOE-STD-1020-201

Proposed STD-1020-2011 attributes include

- Creation of one-source NPH requirement document replacing DOE-STD-1020-2002, and DOE Guide 420.1-2, while essentially maintaining or improving and updating safety provisions of replaced documents
- Consistency with NPH provisions of DOE-STD-1189
- Additional provision of using ANSI/ANS 2.3-2011 as an alternative of developing site-specific probabilistic hazard curves for extreme wind hazard design
- Provision of updated seismic provisions incorporating state-of-the-art developments since publication of ASCE/SEI 43-05 and ASCE 4-98
- Addition of some fundamental provisions for snow, lightning, and volcanic eruption hazards evaluation

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Evaluation and Modification of Existing Facilities

- Requires periodic evaluations by SMEs every ten years or earlier to assess any significant changes that warrant updating safety basis of facility
  - NPH data
  - Data collection methods
  - Design/analysis
  - Evaluation methods
- Provisions do not need to be applied to an existing facility unless
  - Facility undergoing modifications for programmatic reasons, or
  - Facility needs major modifications as defined in STD-1189-2008

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Provisions in STD-1020-2011 on Evaluation and Modification of Existing Facilities (cont'd)

- Upgrading of existing facilities that require extensive NPH-related retrofit can be based on cost-versus-risk-reduction studies
- Formula for reducing NPH return period for facilities with limited remaining life is provided

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Questions?


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Backup material

Seismic Hazards Provisions in STD-1020-2011

- **Seismic design categorization**
  - **Same as in ANS 2.26-2004, as modified in STD-1189-2008 (see table)**
  - **Note: ANS 2.26 reaffirmed in 2010**
- **Site investigations**
  - **Same as in ANS 2.27-2008**
- **PSHA process and requirements**
  - **Same as in ANS 2.29-2008**
  - **Exception for site response analyses, which endorses use of ASCE 4-2011 updated provisions**
  - **Note: ASCE 4-2011 draft in ballot by working group**
- **SSI criteria and requirements**
  - **Same as in ASCE 43-05**
  - **Endorses use of updated provisions of ASCE 4-2011, especially consideration of incoherent input ground motions**

Seismic Hazards Provisions in STD-1020-2011 (cont'd)

- **Design criteria and requirements**
  - **Same as in ASCE 43-05**
  - **Requires use of updated provisions of ASCE 4-2011**
- **For SDC-1 and SDC-2**
  - **Updated design factors to achieve various Limit States to define SSC failure, previously given in STD-1189-2008**
  - **See Table 3-2 of STD-1020-2011**

Extreme Wind Hazards Provisions in STD-1020-2011

- Provides updated criteria and guidance for extreme wind hazards evaluations
  - Straight-line wind, hurricane wind, tornado wind
  - Tornado APC
  - Tornado missiles, hurricane missiles
- SSC design categorization for wind hazards to determine Wind Design Category (WDC)
  - Uses same process and criteria in ANS 2.26-2010 and STD-1189-2008 for seismic hazard evaluations
- Detailed criteria and guidance provided for WDC-3, -4, and -5 SSCs which refer to ANS-2.3-2011
- WDC-1 and -2 SSCs required to be designed by ASCE/SEI 7-10 provisions treating these as Risk Category II and IV SSCs, respectively

Extreme Wind Hazards Provisions in STD-1020-2011 (cont'd)

- For characterization of sites containing WDC-3, -4, -5 SSCs
  - Detailed guidelines and criteria provided for performing site-specific probabilistic extreme wind hazard assessments (PWHAs)
- Alternatively, ANS 2.3-2011 requirements are specified for sites that would use it for determining design basis wind
- For WDC-3, -4, -5 SSCs
  - Return periods for design basis wind speeds were updated as shown in following table

Flood Hazards Provisions in STD-1020-2011

- Provides design criteria and guidance for flood, seiche, and tsunami
  - Essentially retaining those in STD-1020-2002 version
  - Reorganizing for ease of application
- SSC design categorization for flood hazards to determine Flood Design Category (FDC) uses
  - Same process and criteria in ANS 2.26-2011 and DOE-STD-1189-2008 for seismic hazard evaluations
- Detailed criteria and guidance provided for FDC-3, -4, and -5 SSCs
- FDC-1 and -2 SSCs required to be designed by ASCE/SEI 7-10 provisions treating these as Risk Category II and IV SSCs, respectively

Flood Hazards Provisions of STD-1020-2011 (cont'd)

- For characterization of sites for flood hazards
  - Detailed guidelines and criteria provided for performing site-specific probabilistic flood hazard assessments (PFHAs)
  - PFHA and return period establishes design basis flood level (DBFL)
- For facilities with only FDC-1 and -2 SSCs
  - DBFL must not be lower than required by IBC and ASCE 7-10 criteria
- For facilities with FDC-3, -4, -5 SSCs
  - Site-specific PFHA required using DBFL corresponding to return periods shown and rationalized in following table
- Note: WG formed to develop ANS-2.8, "Guidelines for Design Basis and Beyond Design Basis External Flood Evaluation at Nuclear Facilities"

Lightning Hazards Provisions in STD-1020-2011

- **Safety-related SSCs requiring protection from lightning hazards are designated as Lightning Category (LC) SSCs**
- **LC SSCs required to be designed to preclude**
  - **Adverse consequences from lightning hazards, or**
  - **Protected in accordance with NFPA 780-2011**
- **Safety-related SSCs in facilities containing explosives**
  - **Required to meet DOE-STD-3016, Explosives Safety criteria**

Snow Hazards Provisions in STD-1020-2011

- Design categorization for snow hazard evaluation
  - Same as flood hazards
- FDC-1 and FDC-2 SSCs are required to be designed
  - Following ASCE 7-10 provisions as Risk Category II and IV, respectively
  - Using snow Importance Factor of 1.0 and 1.2, respectively
- Snow hazards for FDC-3, -4, and -5 SSCs can be determined using
  - Site-specific probabilistic methods, or
  - Probabilistic data given in ASCE 7-10, and snow Importance Factor of 1.0

Volcanic Eruption Hazards Provisions in STD-1020-2011

- Provides guidelines for characterization of volcanic hazards and for designing SSCs subjected to ashfall loads
- Design categorization for volcanic eruption hazards evaluation
  - Same for seismic design per ANS 2.26-2010